

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND/NOISE POLLUTION CONTROL

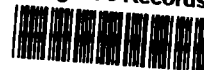
A PRELIMINARY HYDROGEOLOGIC INVESTIGATION IN
THE NORTHERN PORTION OF DEAD CREEK AND VICINITY

By

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EPA Region 5 Records Ctr.



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EAST ST. LOUIS HAZARDOUS WASTE SITES

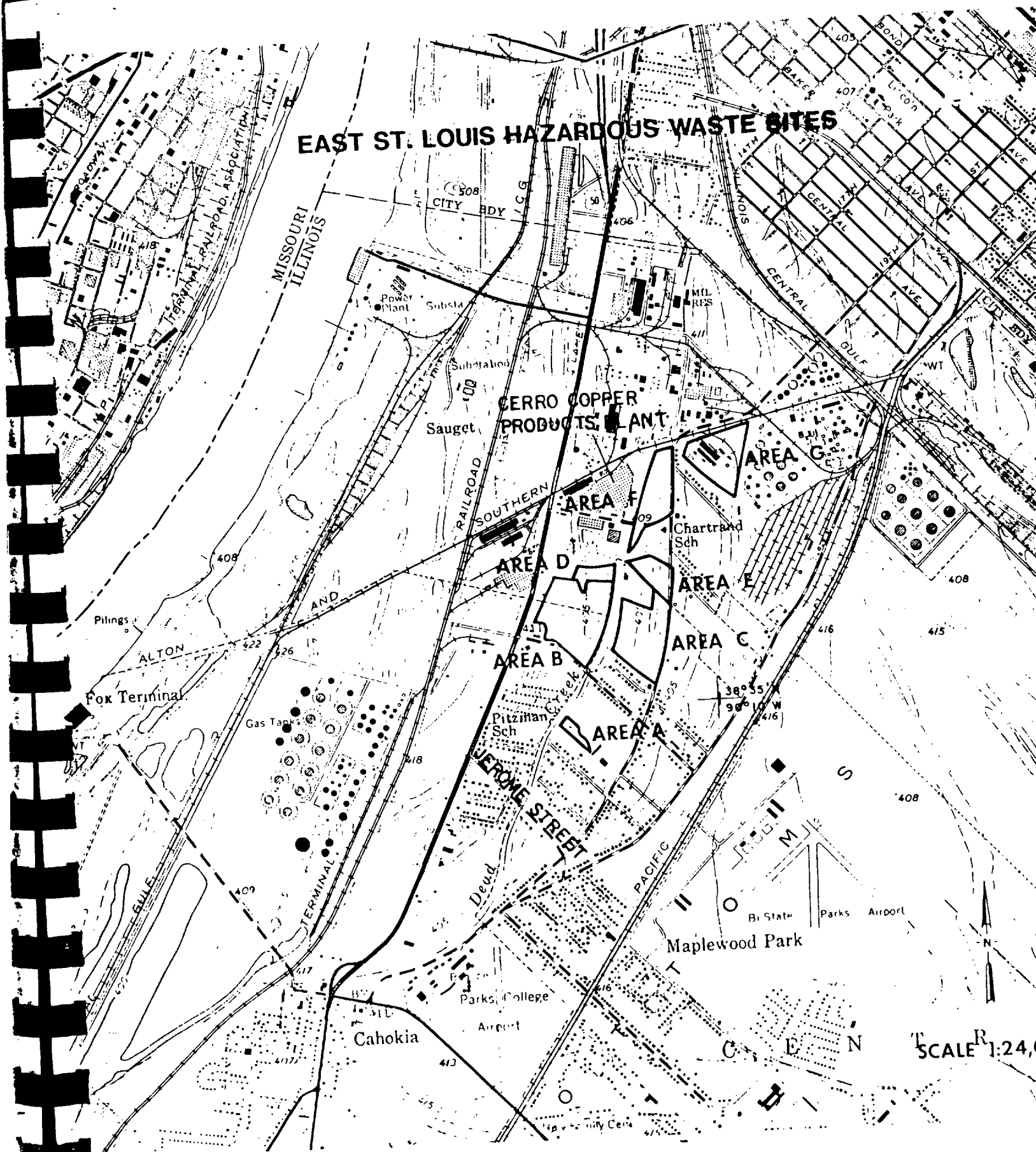


Figure 1a. Waste sites identified by the thermal infrared survey.

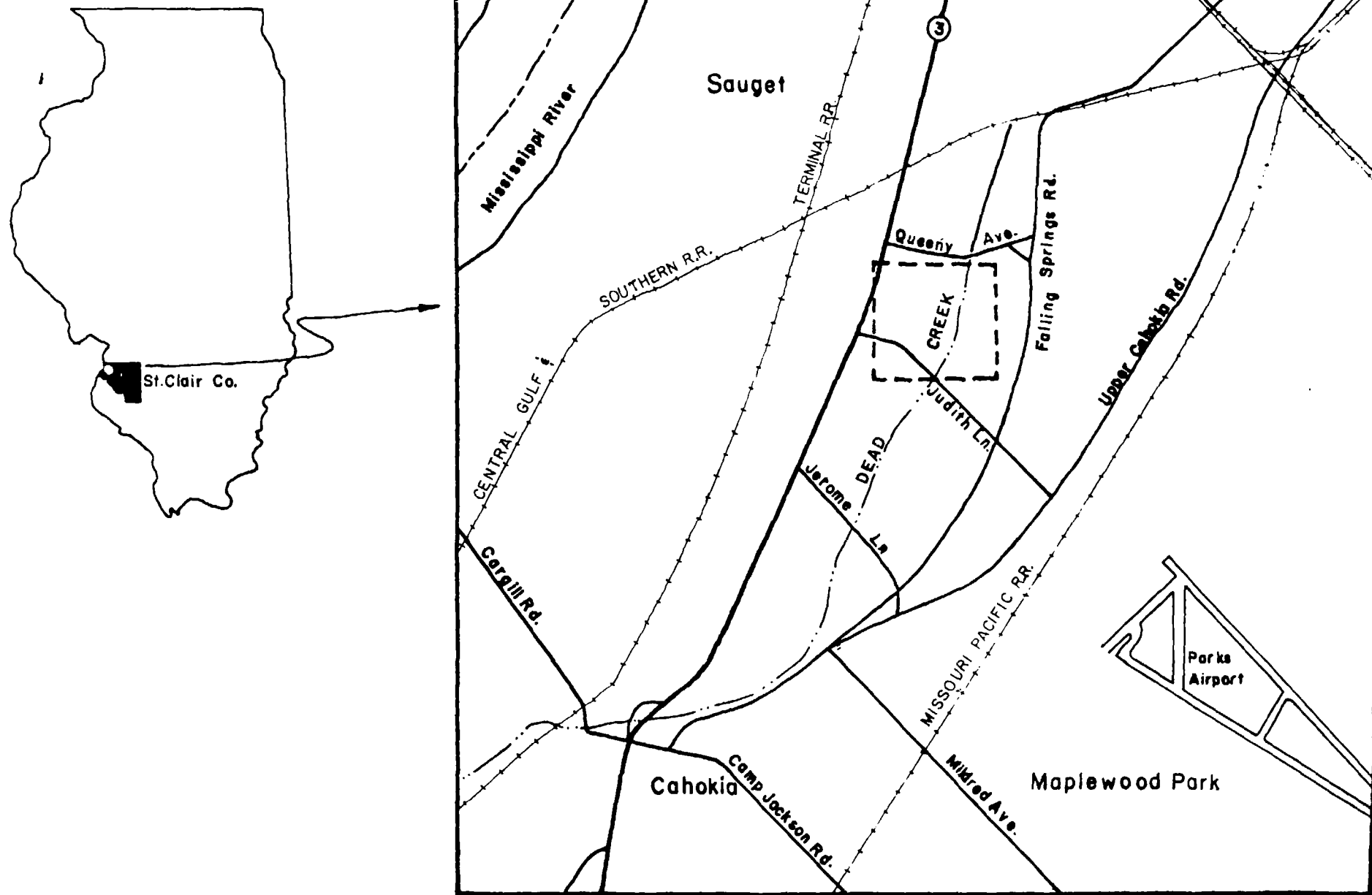
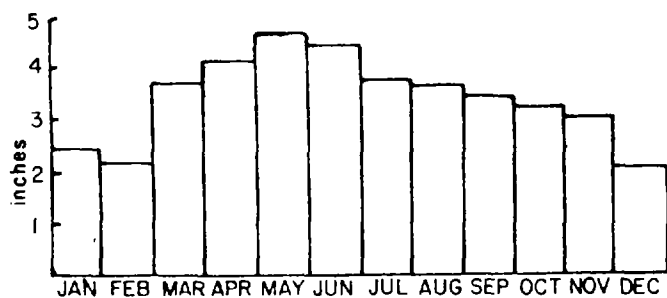
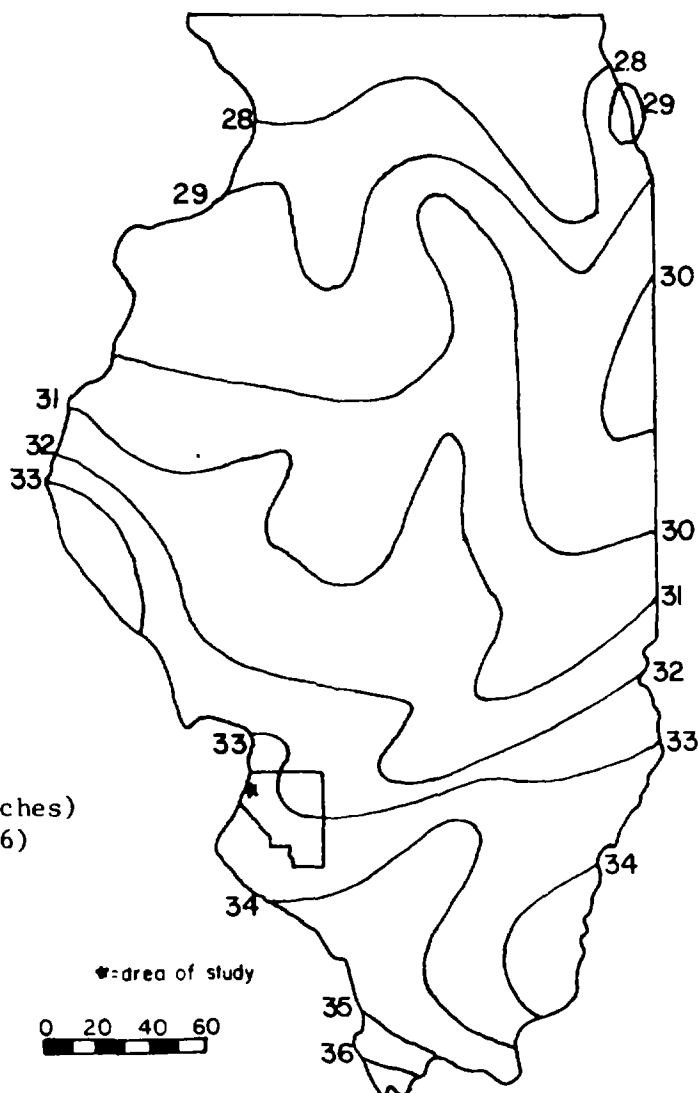


Figure 1. Location of Dead Creek and study site (square)



(a) Mean monthly precipitation at Edwardsville, Illinois (1932-1962)



(b) Mean annual calculated evapotranspiration (in inches) over 45 years (Jones, 1966)

Figure 2. Climatological data

were made to determine the thickness of the fill material. They ranged from 8 to 10 feet in depth and were finished upon reaching the Henry Formation Sands.

Geology

Dead Creek is situated in the Mississippi River flood plain on thick valley fill deposits (100'+). The valley fill is comprised of two formations, one of which is a thin mantle called the Cahokia Alluvium. Derived from the erosion of till and loess, the alluvium consists of unconsolidated, poorly sorted, silt, with some local sand and clay lenses. It appears to have accumulated in valleys during flood intervals after the Wisconsin glaciers had retreated.

The Cahokia Alluvium formation unconformably overlies the Mackinaw Member of the Henry Formation. The Henry Formation is Wisconsin glacial outwash in the form of valley train deposits. It accounts for the majority of the valley fill and is composed of sand and gravel that coarsens with depth. Due to the thickness and water capacity of this formation, it is a major aquifer for the East St. Louis area.

Mississippian limestone underlies the valley fill deposits at a depth of approximately 120 feet (Bergstrom, 1956).

Site Geology

Based on the 12 test holes, 5 hand auger borings, and the ISGS publications, a generalized rock stratigraphic column for shallow depths is shown in Figure 5. Cross sections (Figures 6a and 6b) show that geology at this site corresponds to the general description of the area previously given. The location of these cross sections appear on Figure 4.

Data from the 12 test holes indicates that the Henry Formation sand, which extends to bedrock, is overlain by the Cahokia Alluvium. The thickness of the alluvium is between 6 and 17 feet in the test holes and becomes thinner toward the east. The alluvium is primarily composed of silt with local clay and sand lenses, and also shows a tendency to be sandy at the base.

The Henry Formation is a major aquifer for the area and the portions sampled by the IEPA showed it to be an arkosic, gray, fine to medium grained sand. Former sand pits in the area were excavated to attain these sands.

Permeability values measured in the laboratory (Appendix 2), are in the order of 7×10^{-6} cm/sec and 4.4×10^{-3} cm/sec for the Cahokia Alluvium and Henry sands, respectively. Vertical distribution of permeability values are in Figure 6a.

Hand auger borings P-1 through P-5 were made in the creek bottom and they show that the material there is a fill composed of loosely compacted silty clay to clayey silt (Figure 6b). Because the velocity of creek flow was great enough to erode vertically at one time, a scouring in the creek through the upper silt mantle into the sand occurred. At a later date the energy of the stream decreased and the clayey silt now seen in the bottom of the creek was filled down into the Henry Formation sands. This deposit, since it is less consolidated than the older materials bounding it, is felt to have a permeability in the range of 1.0×10^{-6} cm/sec.

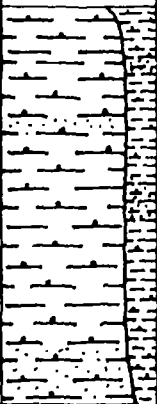
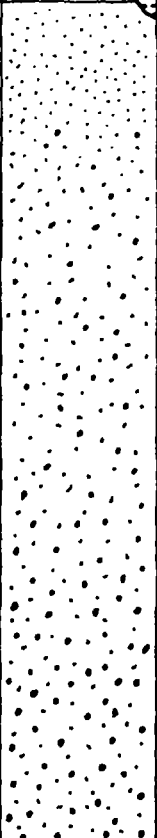
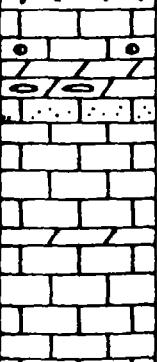
System	Series	Stage	Formation	Column	Thickness (in ft)	Description
Quaternary	Pleistocene	Holocene	Cahokia Alluvium		6-20	Silt, light tan, w/clay and fine sand locally, micaceous.
		Wisconsinan	Henry		100-114	Sand, tan, arkosic, fine grained at top coarsening downward to include some fine to medium grained gravel. Subrounded, moderately sorted.
		Group				Contains: Quartz, chert, feldspars, limestone, ferromagnesian minerals, shell fragments; wood chips and coal fragments at top.
Mississippian	Valmeyeran	Middle Valmeyeran			100+	Limestone

Figure 5. Generalized Geologic Column for unconsolidated deposits to bedrock in the Dead Creek area.

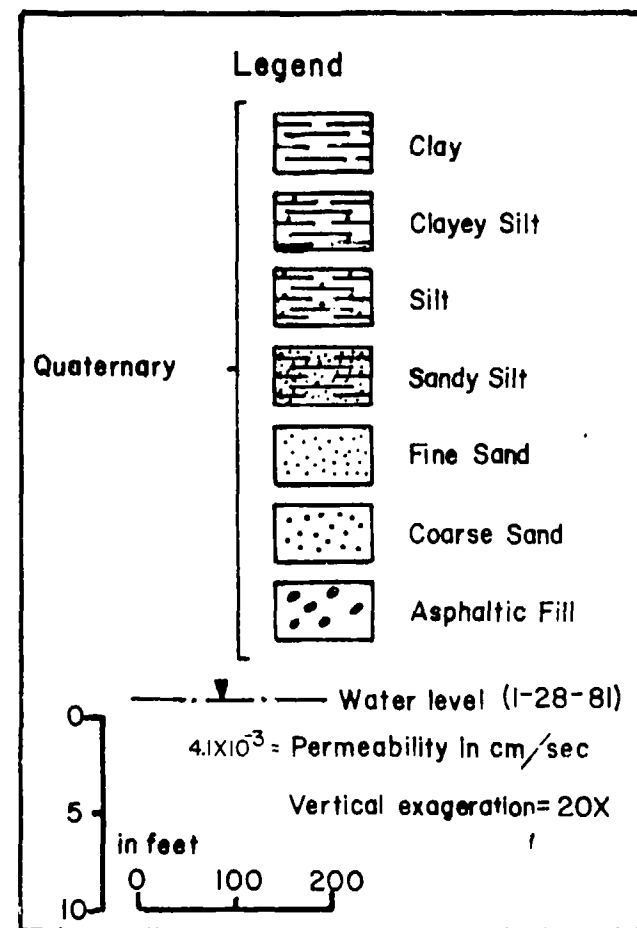
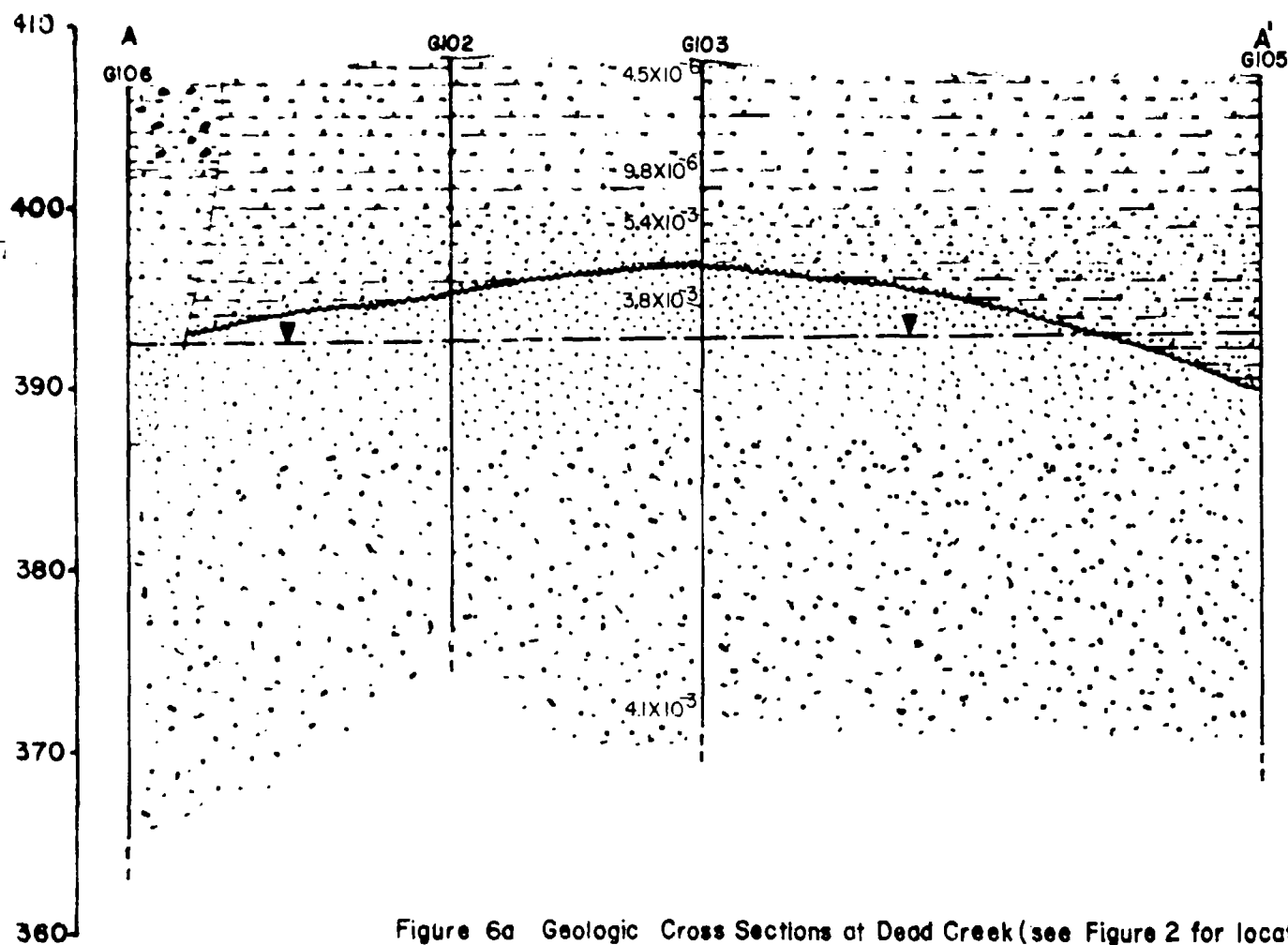
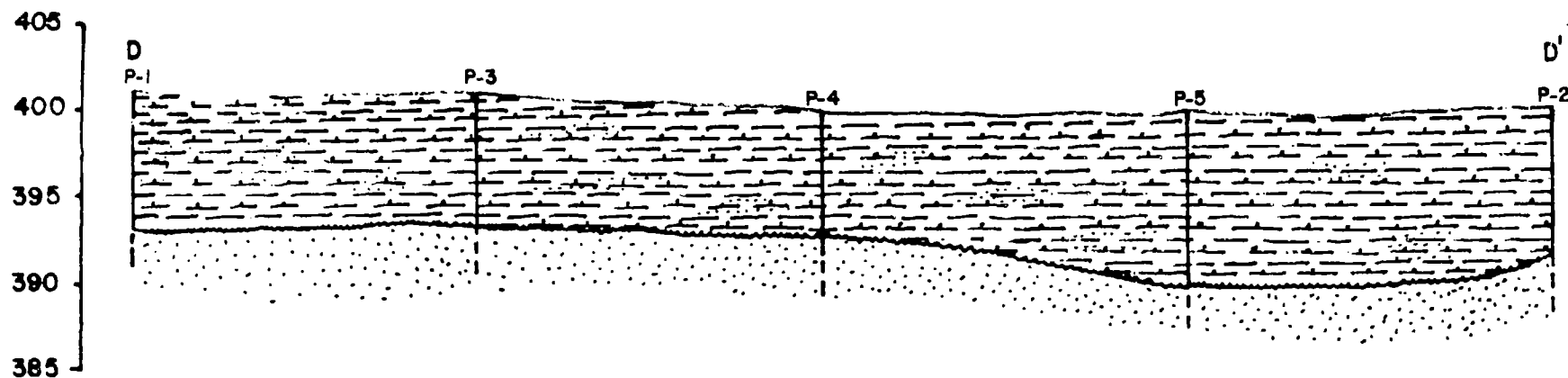


Figure 6a Geologic Cross Sections at Dead Creek (see Figure 2 for locations)

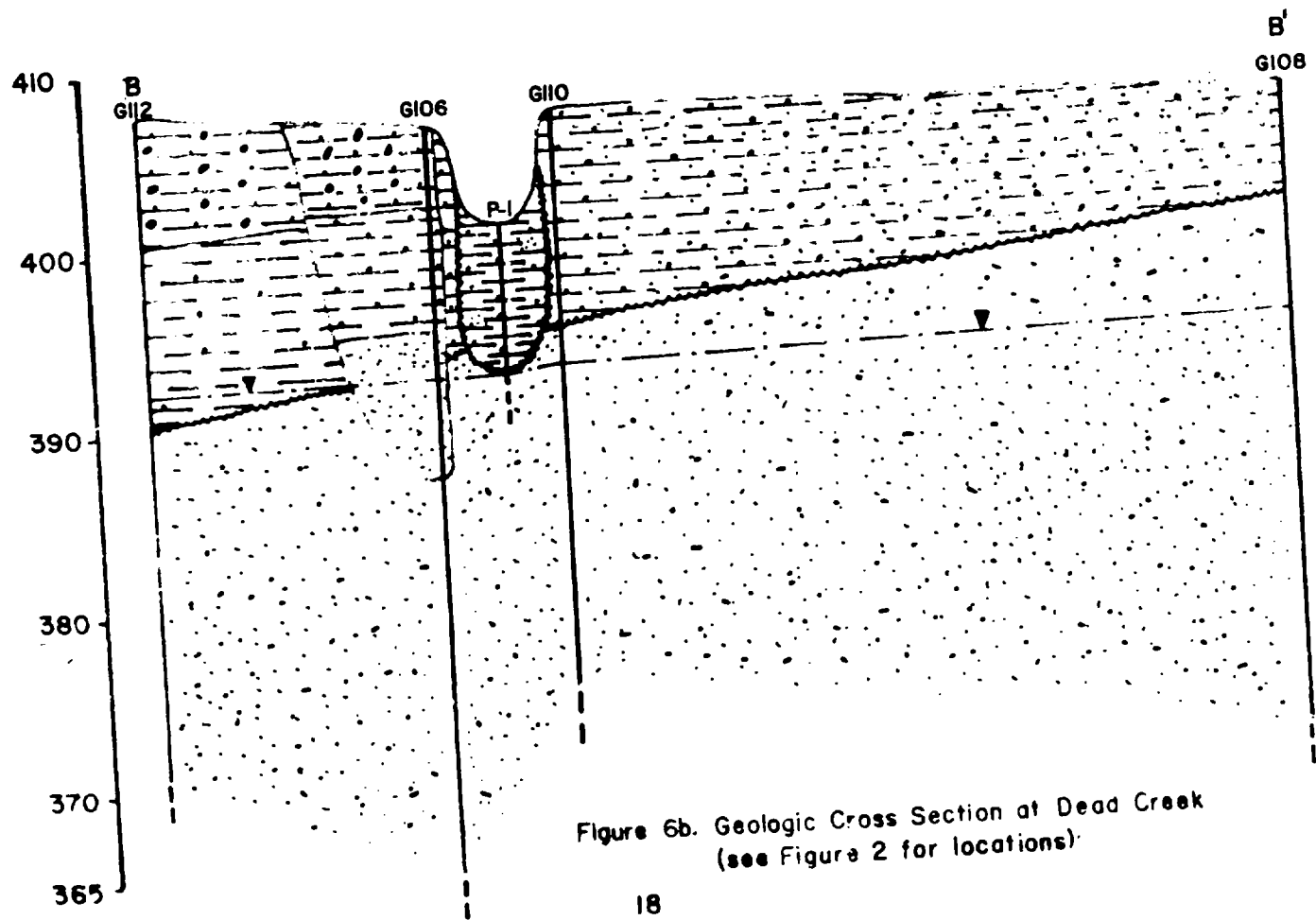
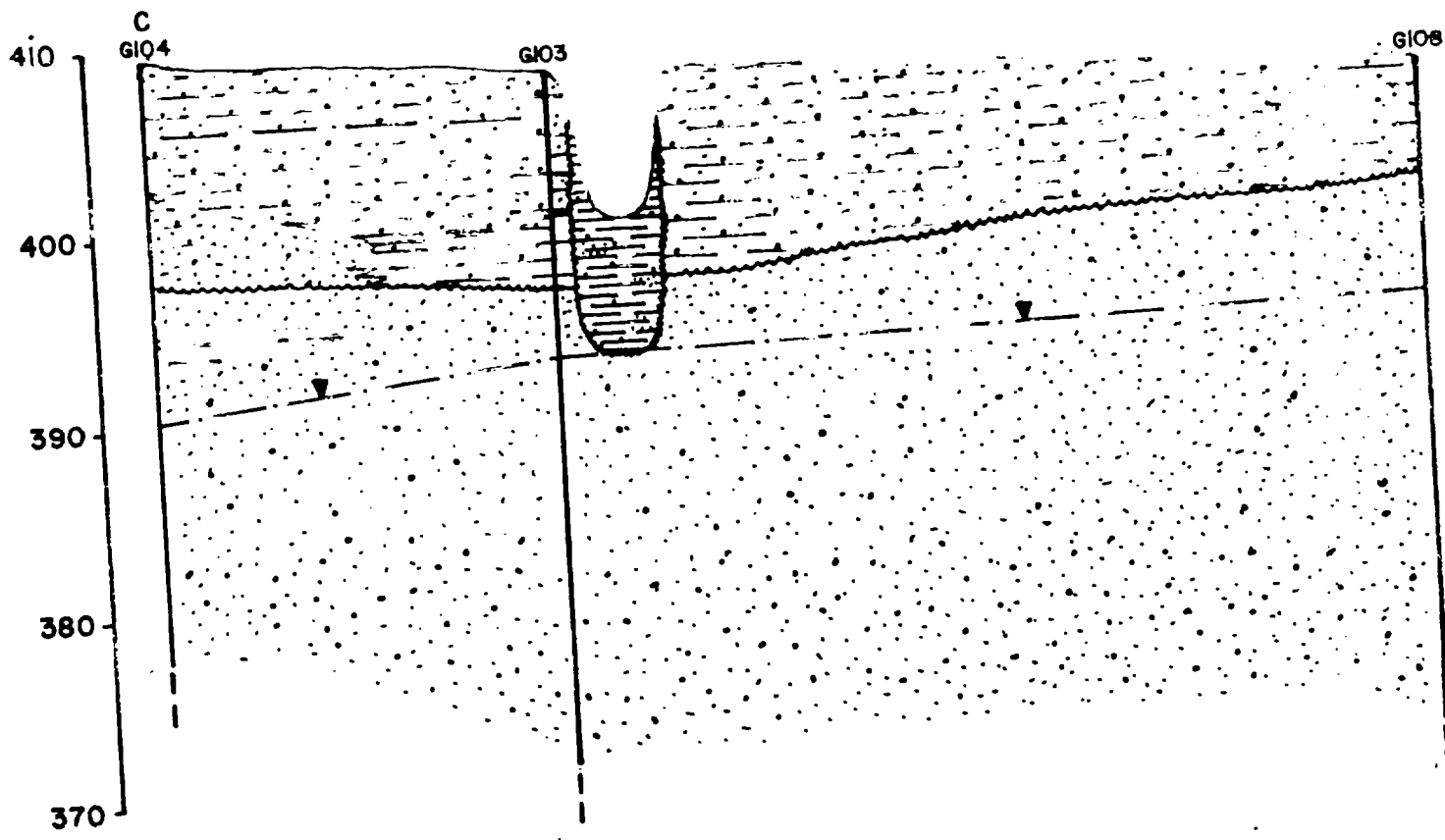


Figure 6b. Geologic Cross Section at Dead Creek
(see Figure 2 for locations)

Inorganic chemicals are analyzed in two locations, G106 and G107, to obtain data outside the creek bed itself. At G106, traces of PCB are shown in the upper three intervals. The metal concentrations show a general decrease with depth, however, analysis at G106 indicates that the metal concentrations of the upper silty fill and the sand immediately below are almost the same. At G107, only the two uppermost samples have been analyzed for metals, and although the data is incomplete, it seems metals and PCB increases with depth. Soils at G107 seem to contain a higher concentration of chemicals than those at G106. This would suggest waste disposal activity nearby. Presently, there is an open dump north of G107. This dump is bounded by the Weise Machinery building on the west, G107 on the south, New Queeny Avenue on the north, and G106 on the east.

Soil samples from P-1, located at the northern part of the creek bed, were analyzed for organics. The three surficial soil samples, to a depth of 3 feet, contain large amounts of PCB and organics. Below this interval, a decrease of organic chemicals is noted with depth, though there is a slight discrepancy with trichlorobenzene and chloronitrobenzene. Except PCB, other organics are not found below 3 feet in depth. Analyses indicate that most of the organics are confined to surficial soils and do not tend to travel vertically. This is probably due to both clay content of surficial soils, and the relatively low solubility of chlorinated hydrocarbons and their associated by products. PCB's show a slight vertical migration that probably reaches the Henry Formation sands and thus the ground water in minor amounts. Outside the creek bed very low amounts of PCB were found but other organics were not; inorganics appear to have traveled downward to some degree.

Ground Water

Aquifer

As stated previously, the Henry Formation sands are the major aquifer in the area. At the creek itself these valley train sands, on an average, rise to within 14 feet of surface. Figures 6a and 6b show the potentiometric level plotted at the site in cross section. It is seen by these cross sections that most of the ground water occurs in the Henry Formation sands. Exceptions occur in the northern and southern portions of the creek where the silt mantle thickens (Figure 6a, A-A') and the ground water level encounters it.

Water table as opposed to leaky artesian conditions (Bergstrom, 1956) prevail at the site because the lower portion of the alluvial silt is permeable enough (5.4×10^{-3}) not to impede vertical movement of the ground water.

The potentiometric surface map, Figure 9, indicates that the hydraulic gradient is very flat in the vicinity of Dead Creek. The gradient is 3'/1060' or .00283 generally moving to the west but with local fluctuations apparent. Periodic measurement of the potentiometric surface appear in Table 2. The following is a brief discussion of potential pollution sources and their impact on ground water.